



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/973,235	10/10/2001	Hideaki Fukuzawa	208954US2RD CONT	7269

22850 7590 04/04/2005

OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER

BERNATZ, KEVIN M

ART UNIT	PAPER NUMBER
----------	--------------

1773

DATE MAILED: 04/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/973,235

Applicant(s)

FUKUZAWA ET AL.

Examiner

Kevin M Bernatz

Art Unit

1773

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 29-33 and 37-60 is/are pending in the application.
- 4a) Of the above claim(s) 29,30 and 37-40 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 31-33 and 41-60 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Response to Amendment

1. Amendments to the specification and claims 31 – 33 and 41 - 43, and addition of new claims 44 – 60, filed on January 19, 2005, have been entered in the above-identified application.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Examiner's Comments

3. Regarding the limitation(s) “a nonmagnetic conductivity layer disposed in contact with the first ferromagnetic layer”, “the first ferromagnetic layer has a film thickness between 0.5 nanometers and 4.5 nanometers” and “wherein the first ferromagnetic layer includes a laminate film”, the Examiner has given the term(s) the broadest reasonable interpretation(s) consistent with the written description in applicants' specification as it would be interpreted by one of ordinary skill in the art. *In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Donaldson Co., Inc.*, 16 F.3d 1190, 1192-95, 29 USPQ2d 1845, 1848-50 (Fed. Cir. 1994). See MPEP 2111. Specifically, the Examiner has required the non-magnetic conductive layer to be in contact with at least one laminate of the first ferromagnetic layer, and the laminate layer of the first ferromagnetic layer that is in contact with the non-magnetic conductive layer must possess the recited thickness limitation.

Art Unit: 1773

4. Regarding the limitation "a material having a bulk resistivity at room temperature not larger than 10 microhm centimeter", the Examiner notes that the materials listed in claim 48 and specification page 7 are deemed to necessarily meet this limitation.

Double Patenting

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

6. Claims 31, 41, 44 – 52, 55, 59 and 60 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 30 of U.S. Patent No. 6,303,218 B1 (Kamiguchi et al.). Although the conflicting claims are not identical, they are not patentably distinct from each other because Kamiguchi et al. anticipate and/or render obvious the claimed invention.

Regarding claims 31 and 41, Kamiguchi et al. disclose the claimed invention as described in Paragraph 5 of the Office Action mailed October 19, 2004.

Regarding the amended limitation(s) directed to the thickness of the first ferromagnetic layer, the Examiner notes that the disclosure of Kamiguchi et al.

Art Unit: 1773

teach(es) that the claimed invention is an obvious variation of the disclosed invention (*col. 24, line 36 bridging col. 25, line 5*).

Applicants are reminded that while it is generally prohibited from using the disclosure of a potentially conflicting patent or application in an Double Patenting analysis, there are two exceptions permitted by the MPEP. Specifically, "those portions of the specification which provide support for the patent claims may also be examined and considered when addressing the issue of whether a claim in the application defines an obvious variation of an invention claimed in the patent". In the instant case, Kamiguchi et al. claims a first magnetic layer and the relied upon disclosure clearly supports such claim language, including providing an explicit teaching that the claimed thickness is an obvious variation on the claimed Kamiguchi et al. invention.

Regarding claims 44 – 52, 55, 59 and 60, Kamiguchi et al. claim substantially identical subject matter (*claims 1 – 30*) and/or disclose the subject matter as obvious variations of the claimed invention in the supporting portions of the patented disclosure (*columns 24 – 30*). See below for the interpretation of the language of claims 45, 46 and 55.

7. Claims 53 and 54 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 30 of U.S. Patent No. 6,303,218 B1 (Kamiguchi et al.) as applied above, and further in view of Kishi et al. (U.S. Patent No. 5,729,411).

Kamiguchi et al. is relied upon as described above.

Kamiguchi et al. fail to disclose an antiferromagnetic (AFM) layer meeting applicants' claimed limitations.

However, Kishi et al. teach AFM layers meeting applicants' claimed limitations in order to help bias the adjacent ferromagnetic layer with a high corrosion resistance AFM layer requiring only low temperature annealing (*Figures 4 – 11; col. 2, lines 10 – 56; and col. 7, line 31 bridging col. 10, line 22*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Kamiguchi et al. to utilize an AFM layer meeting applicants' claimed limitations as taught by Kishi et al., since such a layer helps bias the adjacent ferromagnetic layer with a high corrosion resistance AFM layer requiring only low temperature annealing.

8. Claims 56 and 58 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 30 of U.S. Patent No. 6,303,218 B1 (Kamiguchi et al.) as applied above, and further in view of Gill et al. (U.S. Patent No. 5,701,222).

Kamiguchi et al. is relied upon as described above.

Kamiguchi et al. fail to disclose the magnetoresistive (MR) head structure claimed by applicants.

However, Gill et al. teach that such a structure is a known structure for forming a shield-type magnetic head including a MR effect element which is capable of achieving large response to an external magnetic field (*Figure 3b and col. 4, lines 30 – 49*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Kamiguchi et al. to use a shield-type magnetic head meeting applicants' claimed apparatus limitations as taught by Gill et al. in order to form a magnetic head capable of achieving a large response to an external magnetic field.

9. Claim 57 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 30 of U.S. Patent No. 6,303,218 B1 (Kamiguchi et al.) in view of Gill et al. as applied above, and further in view of Hashimoto (U.S. Patent No. 5,847,907).

Kamiguchi et al. and Gill et al. are relied upon as described above.

Neither Gill et al. nor Kamiguchi et al. disclose a MR effect element comprising an upper and lower pole meeting applicants' claimed structural limitations.

However, Hashimoto teaches that upper and lower poles meeting applicants' claimed structural limitations are known to be used in the prior art to offer better control of the track width of the MR head, which directly impacts the ability to read and write at high recording densities (*col. 3, line 51 bridging col. 4, line 34*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Kamiguchi et al. in view of Gill et al. to use an upper and lower pole meeting applicants' claimed structural limitations as taught by Hashimoto, since such poles offer better control of the track width of the MR head, which directly impacts the ability to read and write at high recording densities.

10. Claims 31, 41, 44 – 55, 59 and 60 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 35 of U.S. Patent No. 6,338,899 B1 (Fukuzawa et al.). Although the conflicting claims are not identical, they are not patentably distinct from each other because Fukuzawa et al. anticipate and/or render obvious the claimed invention.

Regarding claims 31 and 41, Fukuzawa et al. disclose the claimed invention as described in Paragraph 6 of the Office Action mailed October 19, 2004.

Regarding the amended limitation(s) directed to the thickness of the first ferromagnetic layer, the Examiner notes that the Fukuzawa et al. discloses the claimed limitations (*claim 24*).

Regarding claims 44 – 55, 59 and 60, Fukuzawa et al. claim substantially identical subject matter (*claims 1 – 35*) and/or disclose the subject matter as obvious variations of the claimed invention in the supporting portions of the patented disclosure. See below for the interpretation of the language of claims 45, 46 and 55.

11. Claims 56 and 58 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 30 of U.S. Patent No. 6,338,899 B1 (Fukuzawa et al.) as applied above, and further in view of Gill et al. ('222).

Fukuzawa et al. is relied upon as described above.

Fukuzawa et al. fail to disclose the magnetoresistive (MR) head structure claimed by applicants.

However, Gill et al. teach that such a structure is a known structure for forming a shield-type magnetic head including a MR effect element which is capable of achieving large response to an external magnetic field (*Figure 3b and col. 4, lines 30 – 49*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Fukuzawa et al. to use a shield-type magnetic head meeting applicants' claimed apparatus limitations as taught by Gill et al. in order to form a magnetic head capable of achieving a large response to an external magnetic field.

12. Claim 57 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 30 of U.S. Patent No. 6,338,899 B1 (Fukuzawa et al.) in view of Gill et al. as applied above, and further in view of Hashimoto ('907).

Fukuzawa et al. and Gill et al. are relied upon as described above.

Neither Gill et al. nor Fukuzawa et al. disclose a MR effect element comprising a upper and lower pole meeting applicants' claimed structural limitations.

However, Hashimoto teaches that upper and lower poles meeting applicants' claimed structural limitations are known to be used in the prior art to offer better control of the track width of the MR head, which directly impacts the ability to read and write at high recording densities (*col. 3, line 51 bridging col. 4, line 34*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Fukuzawa et al. in view of Gill et al. to use an upper and lower pole meeting applicants' claimed structural limitations as taught by Hashimoto, since such poles offer better control of the track width of the MR head, which directly impacts the ability to read and write at high recording densities.

13. Claims 31, 41, 44 – 52, 55, 59 and 60 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 3 of U.S. Patent No. 6,853,520 B1 (Fukuzawa et al.). The Examiner notes that this is the published patent from Application 09/944,075. Although the conflicting claims are not identical, they are not patentably distinct from each other because Fukuzawa et al. anticipate and/or render obvious the claimed invention.

Regarding claims 31 and 41, Fukuzawa et al. disclose the claimed invention as described in Paragraph 7 of the Office Action mailed October 19, 2004.

Regarding the amended limitation(s) directed to the thickness of the first ferromagnetic layer, the Examiner notes that Fukuzawa et al. discloses thickness values meeting applicants' claimed range (*claim 2*).

Regarding claims 44 – 52, 55, 59 and 60, Fukuzawa et al. claim substantially identical subject matter (*claims 1 – 3*) and/or disclose the subject matter as obvious variations of the claimed invention in the supporting portions of the patented disclosure. See below for the interpretation of the language of claims 45, 46 and 55.

14. Claims 53 and 54 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 3 of U.S. Patent No. 6,853,520 B1 (Fukuzawa et al.) as applied above, and further in view of Kishi et al. ('411).

Fukuzawa et al. is relied upon as described above.

Fukuzawa et al. fail to disclose an antiferromagnetic (AFM) layer meeting applicants' claimed limitations.

However, Kishi et al. teach AFM layers meeting applicants' claimed limitations in order to help bias the adjacent ferromagnetic layer with a high corrosion resistance AFM layer requiring only low temperature annealing (*Figures 4 – 11; col. 2, lines 10 – 56; and col. 7, line 31 bridging col. 10, line 22*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Fukuzawa et al. to utilize an AFM layer meeting applicants' claimed limitations as taught by Kishi et al., since such a layer helps bias the adjacent ferromagnetic layer with a high corrosion resistance AFM layer requiring only low temperature annealing.

15. Claims 56 and 58 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 3 of U.S. Patent No. 6,853,520 B1 (Fukuzawa et al.) as applied above, and further in view of Gill et al. ('222).

Fukuzawa et al. is relied upon as described above.

Fukuzawa et al. fail to disclose the magnetoresistive (MR) head structure claimed by applicants.

However, Gill et al. teach that such a structure is a known structure for forming a shield-type magnetic head including a MR effect element which is capable of achieving large response to an external magnetic field (*Figure 3b and col. 4, lines 30 – 49*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Fukuzawa et al. to use a shield-type magnetic head meeting applicants' claimed apparatus limitations as taught by Gill et al. in order to form a magnetic head capable of achieving a large response to an external magnetic field.

16. Claim 57 is rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 3 of U.S. Patent No. 6,853,520 B1 (Fukuzawa et al.) in view of Gill et al. as applied above, and further in view of Hashimoto ('907).

Fukuzawa et al. and Gill et al. are relied upon as described above.

Neither Gill et al. nor Fukuzawa et al. disclose a MR effect element comprising an upper and lower pole meeting applicants' claimed structural limitations.

However, Hashimoto teaches that upper and lower poles meeting applicants' claimed structural limitations are known to be used in the prior art to offer better control of the track width of the MR head, which directly impacts the ability to read and write at high recording densities (*col. 3, line 51 bridging col. 4, line 34*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Fukuzawa et al. in view of Gill et al. to use an upper and lower pole meeting applicants' claimed structural limitations as taught by Hashimoto, since such poles offer better control of the track width of the MR head, which directly impacts the ability to read and write at high recording densities.

Claim Rejections - 35 USC § 112

17. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

18. Claims 33, 43 and 46 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 33 and 43 recite the language that the distance is "equal to or larger", yet the as-filed disclosure only seems to support the language "equal to or smaller". While the Examiner acknowledges that "upper" and "lower" magnetic shields are interchangeable in the claim (i.e. no positive structural location is claimed for the "upper" and "lower" shields), and hence the claimed scope is identical whether the language is "equal to or smaller" or "equal to or greater", applicants must still have support for the claim language.

Claim 46 recites a laminate film for the first ferromagnetic layer, implying that the total thickness of the entire laminate film is within the claimed thickness range.

However, applicants' as-filed disclosure does not recite that in the case of laminate first ferromagnetic layers, the combined thickness of all laminate films must meet the claimed thickness limitation. As such, the Examiner has interpreted this claim as described above in Paragraph 3.

19. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

20. Claims 44, 46 and 55 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "high" in claim 44 is a relative term which renders the claims indefinite. The term "high" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. This rejection can be overcome by removing the word "high" from the claims or amending the claims to positively recite a range in the conductivity. For purposes of evaluating the prior art, the Examiner has interpreted the claim as simply requiring a nonmagnetic "conductive" layer.

Claim 46 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such

Art Unit: 1773

omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: how the multilayered laminate is "in contact with" the non-magnetic conductive layer (since "in contact" precludes layers therebetween) and how the first magnetic layer thickness applies to the laminate film (i.e. is the total film limited in thickness, both laminate layers, or just the laminate layer adjacent to the nonmagnetic conductive film?). For the purpose of evaluating the prior art, the Examiner has interpreted claim 46 as reciting that at least one of the NiFe ally or layer containing Co is in contact with the non-magnetic conductive layer and that the layer disposed in contact with the non-magnetic conductive layer must meet the claimed thickness limitation.

Claim 55 recites the limitation "the second nonmagnetic conductivity layer" in line 2. There is insufficient antecedent basis for this limitation in the claim. The Examiner notes that "second" appears to be a typographical error and claim has been interpreted as if the word "second" was deleted.

Claim Rejections - 35 USC § 102

21. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Art Unit: 1773

22. Claims 31, 41, 44 – 55, 59 and 60 rejected under 35 U.S.C. 102(e) as being anticipated by Kamiguchi et al. (U.S. Patent No. 6,303,218).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131. *A statement that the invention was commonly owned at the time of the invention is not sufficient to overcome a rejection predicated on 35 U.S.C. 102(e).*

Regarding claims 31, 41, 44 – 52, 55, 59 and 60, Kamiguchi et al. disclose the claimed limitations as essentially described above in Paragraph 6.

Regarding claims 53 and 54, Kamiguchi et al. disclose AFM layers meeting applicants' claimed limitations (*col. 30, lines 8 – 25 – e.g. Pt₅₀Mn₅₀*).

Claim Rejections - 35 USC § 103

23. Claims 31, 33, 41, 43 – 50, 52, 55, 56 and 58 – 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gurney et al. (U.S. Patent No. 5,422,571) in view of Gill et al. ('222).

Regarding claims 31, 41, 44, 56 and 58 - 60, Gurney et al. disclose a magnetic head assembly comprising a head slider (*col. 3, line 40 bridging col. 4, line 34*) that comprises a MR effect head including a nonmagnetic spacer layer (*Figure 2, element*

Art Unit: 1773

37), first (*element 35*) and second (*element 39*) ferromagnetic layers separated by the nonmagnetic spacer layer, the first ferromagnetic layer having a magnetization direction at an angle relative to a magnetization direction of the second ferromagnetic layer at zero applied magnetic field (*Figure 2*), the magnetization of the first ferromagnetic layer freely rotating in a magnetic field signal (*Figure 2 and col. 4, lines 35 – 59*), and a nonmagnetic conductivity layer disposed in contact with the first ferromagnetic layer so that the first ferromagnetic layer is disposed between the nonmagnetic conductivity layer and the nonmagnetic spacer layer (*element 33; col. 4, lines 35 – 59; and col. 6, lines 29 – 39*), and a suspension arm holding the MR effect head (*col. 3, line 40 bridging col. 4, line 34*), wherein the first ferromagnetic layer has a film thickness between 0.5 nm and 4.5 nm (*col. 6, lines 29 – 39 and Figure 3B*).

Gurney et al. fail to disclose a second ferromagnetic layer meeting applicants' claimed structural and property limitations, though Gurney et al. does disclose that the second ferromagnetic layer is the "pinned" ferromagnetic layer having a magnetization direction which remains in a constant direction in the presence of an applied magnetic field.

However, Gill et al. teach that a pinned layer meeting applicants' claimed limitations (i.e. a "synthetic pinned layer") is known in the art to be desired since it produces an effective pinning magnetic field in both small and moderate externally applied magnetic fields (*col. 6, lines 28 – 46*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Gurney et al. to utilize a second

Art Unit: 1773

ferromagnetic layer meeting applicants' claimed limitations as taught by Gill et al., since such a structure produces an effective pinning magnetic field in both small and moderate externally applied magnetic fields.

Regarding the apparatus limitations of claims 41, 56 and 58, Gurney et al. fail to disclose the MR structure claimed by applicants (i.e. a substrate and an upper and lower shield layer). However, Gill et al. teach that such a structure is a known structure for forming a shield-type magnetic head including a MR effect element which is capable of achieving large response to an external magnetic field (*Figure 3b and col. 4, lines 30 – 49*).

Regarding claims 33 and 43, the Examiner notes that the "upper" and "lower" shield and gap layers can be inverted since either capping layer 147 deposited over layer S2 or layer 50 under layer S1 can be considered the "substrate". Since the layers can be inverted, every embodiment necessarily meets applicants' claimed limitations since if the two distances are equal or greater in one direction, but simply inverting what is considered the "substrate" and "upper"/"lower" layers, the two distances will automatically be equal or smaller in relative distance.

Regarding claims 45, 48 – 50, 52 and 55, Gurney et al. disclose non-magnetic conductive layers meeting applicants' claimed material and structural limitations (*Figures 5 and 8; col. 6, lines 29 – 39; col. 7, lines 30 – 35; col. 8, line 29 bridging col. 9, line 67*).

Art Unit: 1773

Regarding claims 46 and 47, Gurney et al. disclose ferromagnetic layers meeting applicants' claimed limitations (*Figure 8, elements 94, 96 and 97; col. 8, lines 64 – 66; and col. 10, lines 22 – 42*).

24. Claims 53 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gurney et al. in view of Gill et al. as applied above, and further in view of Kishi et al. ('411).

Gurney et al. and Gill et al. are relied upon as described above.

Neither Gurney et al. nor Gill et al. disclose an antiferromagnetic (AFM) layer meeting applicants' claimed limitations.

However, Kishi et al. teach AFM layers meeting applicants' claimed limitations in order to help bias the adjacent ferromagnetic layer with a high corrosion resistance AFM layer requiring only low temperature annealing (*Figures 4 – 11; col. 2, lines 10 – 56; and col. 7, line 31 bridging col. 10, line 22*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Gurney et al. in view of Gill et al. to utilize an AFM layer meeting applicants' claimed limitations as taught by Kishi et al., since such a layer helps bias the adjacent ferromagnetic layer with a high corrosion resistance AFM layer requiring only low temperature annealing.

Art Unit: 1773

25. Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gurney et al. in view of Gill et al. as applied above, and further in view of Hashimoto ('907).

Gurney et al. and Gill et al. are relied upon as described above.

Neither Gill et al. nor Gurney et al. disclose a MR effect element comprising a upper and lower pole meeting applicants' claimed structural limitations.

However, Hashimoto teaches that upper and lower poles meeting applicants' claimed structural limitations are known to be used in the prior art to offer better control of the track width of the MR head, which directly impacts the ability to read and write at high recording densities (*col. 3, line 51 bridging col. 4, line 34*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Gurney et al. in view of Gill et al. to use an upper and lower pole meeting applicants' claimed structural limitations as taught by Hashimoto, since such poles offer better control of the track width of the MR head, which directly impacts the ability to read and write at high recording densities.

26. Claims 32 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gurney et al. in view of Gill et al. as applied above, and further in view of Otsuka et al. (U.S. Patent No. 4,789,910).

Gurney et al. and Gill et al. are relied upon as described above.

Neither Gill et al. nor Gurney et al. disclose a surface roughness of the upper surface of the "lower" magnetic gap being smaller than the thickness of the antiferromagnetic coupling film (i.e. $\sim 4 - 8 \text{ \AA}$).

However, Otsuka et al. teach that forming head gap films in MR elements which are under the ferromagnetic layers should necessarily possess a surface roughness of 10 Å or less, since the smaller the surface roughness the better chance of yielding high permeable magnetic films possessing good magnetic properties and reduced gap loss (*col. 4, lines 62 – 65; col. 5, lines 1 – 8; and col. 6, line 51 bridging col. 7, line 6*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Gill et al. to use a surface roughness meeting applicants' claimed limitations as taught by Otsuka et al. since the smaller the surface roughness the better chance of yielding high permeable magnetic films possessing good magnetic properties and reduced gap loss.

Response to Arguments

27. The Double Patenting rejection of claims 31, 41 and 44 - 60 in view of various references

Applicant(s) arguments have been considered but are moot in view of the new ground(s) of rejection.

28. The prior rejection of claims 31 – 33 and 41 - 43 under 35 U.S.C § 102(b) and/or 103(a) – Gill et al.

The prior rejection of claims 31 – 33 and 41 - 43 under 35 U.S.C § 102(b) and/or 103(a) – Kamiguchi et al.

Applicant(s) arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

29. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Cohen et al. (U.S. Patent No. 6,195,232 B1) disclose using a dual Cu/Ti seed layer under ferromagnetic layers in order to insure good electrical conductivity and adhesion properties (*col. 9, line 1 bridging col. 10, line 51*).

30. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Applicants' amendment resulted in embodiments not previously considered (i.e. "the first ferromagnetic layer has a thickness between 0.5 nanometers and 4.5

Art Unit: 1773


nanometers") which necessitated the new grounds of rejection, and hence the finality of this action.

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB
March 31, 2005


Kevin M. Bernatz, PhD
Primary Examiner